

# REPORT DOCUMENTATION PAGE

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OMB No. 0704-0188

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1. REPORT DATE (DD-MM-YYYY)

2. REPORT TYPE

Technical Papers

3. DATES COVERED (From - To)

4. TITLE AND SUBTITLE

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

5d. PROJECT NUMBER

2303

5e. TASK NUMBER

M208

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Air Force Research Laboratory (AFMC)  
AFRL/PRS  
5 Pollux Drive  
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8. PERFORMING ORGANIZATION  
REPORT

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Air Force Research Laboratory (AFMC)  
AFRL/PRS  
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10. SPONSOR/MONITOR'S  
ACRONYM(S)

11. SPONSOR/MONITOR'S  
NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

20021212 094

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:

a. REPORT

Unclassified

b. ABSTRACT

Unclassified

c. THIS PAGE

Unclassified

17. LIMITATION  
OF ABSTRACT

A

18. NUMBER  
OF PAGES

19a. NAME OF RESPONSIBLE  
PERSON

Leilani Richardson

19b. TELEPHONE NUMBER

(include area code)

(661) 275-5015

Standard Form 298 (Rev. 8-98)  
Prescribed by ANSI Std. Z39.18

C8

MEMORANDUM FOR PR (Contractor/In-House Publication)

FROM: PROI (TI) (STINFO)

18 Apr 2000

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-AB-2000-075**  
Vij, V., Boatz, J.A., Tham, F., Vij, A., and Christe, K.O., "On the Lewis Acidity of LiF" (Abstract)

**16<sup>th</sup> International Symposium of Fluorine Chemistry**  
**(Durham, UK, 23 Jul 00) (Submission Deadline: 18 Apr 2000)**

**(Statement A)**

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.

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Comments: \_\_\_\_\_  
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APPROVED/APPROVED AS AMENDED/DISAPPROVED

\_\_\_\_\_  
PHILIP A. KESSEL Date \_\_\_\_\_  
Technical Advisor  
Propulsion Science and Advanced Concepts Division

## ON THE LEWIS ACIDITY OF LiF

V. Vij, J. A. Boatz, F. Tham, A. Vij and K. O. Christe\*

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Based on the recently developed  $pF^-$  Lewis acidity scale,<sup>1</sup> free gaseous LiF is a surprisingly strong Lewis acid, comparable to  $SiF_4$ . It was therefore of interest to study whether a strong Lewis base, such as CsF, could transfer a fluoride ion to LiF with formation of a  $LiF_2^-$  anion. Theoretical calculations were carried out for  $LiF_2^-$  and show that free gaseous  $LiF_2^-$  is a linear, vibrationally stable species. Furthermore, the phase-diagram of the LiF/CsF system shows a eutectic at a 1:1 mole ratio that gives a distinct X-ray powder diffraction pattern.<sup>2</sup> We have prepared this eutectic by fusion of a 1:1 mixture of LiF and CsF in a platinum crucible. Single crystals were obtained by slow cooling of the melt in a dry nitrogen stream. The resulting product was characterized by vibrational spectroscopy, and its crystal structure was determined. It is shown that  $CsLiF_2$  does not contain isolated  $LiF_2^-$  anions, but exhibits an interesting three-dimensional network of alternating tetra-coordinated  $LiF_4$  and octa-coordinated  $CsF_8$  units.

1. K. O. Christe, D. A. Dixon, D. McLemore, W. W. Wilson, J. A. Sheehy and J. A. Boatz, *J. Fluorine Chem.*, 2000, **101**, 151.
2. D. L. Deadmore and J. S. Machin, *J. Phys. Chem.*, 1960, **64**, 824.